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NOTIFICATION OF ELECTION

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Date of mailing (day/month/year) 25 November 1999 (25.11.99)	
International application No. PCT/FI99/00321	Applicant's or agent's file reference HS/FI980908
International filing date (day/month/year) 21 April 1999 (21.04.99)	Priority date (day/month/year) 24 April 1998 (24.04.98)
Applicant NISKANEN, Heikki	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:27 October 1999 (27.10.99)☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

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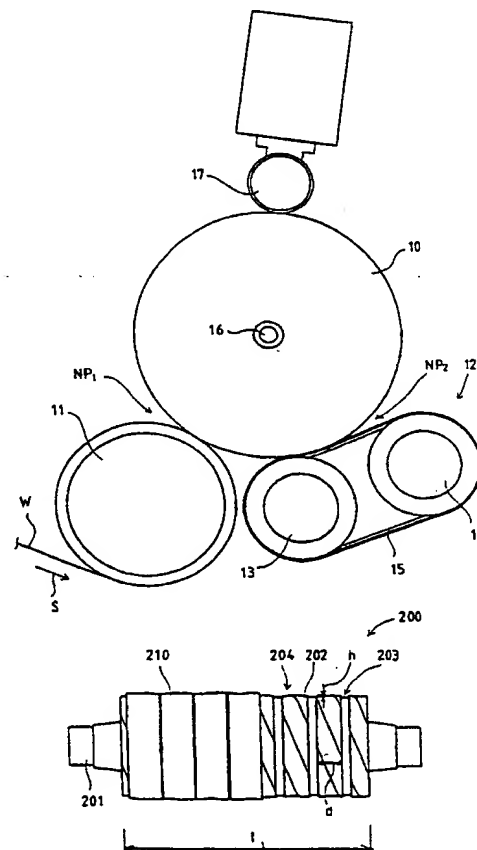


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: B65H 18/22	A1	(11) International Publication Number: WO 99/55608 (43) International Publication Date: 4 November 1999 (04.11.99)
(21) International Application Number: PCT/FI99/00321 (22) International Filing Date: 21 April 1999 (21.04.99) (30) Priority Data: 980908 24 April 1998 (24.04.98) FI (71) Applicant (for all designated States except US): VALMET CORPORATION [FI/FI]; Panuntie-6 , FIN-00620 Helsinki (FI). <i>Fabianinkatu 9A 00130</i> (72) Inventor; and (75) Inventor/Applicant (for US only): NISKANEN, Heikki [FI/FI]; Satakunnanpolku 37, FIN-04400 Järvenpää (FI). (74) Agent: FORSSÉN & SALOMAA OY; Yrjönkatu 30, FIN-00100 Helsinki (FI).		(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> <i>In English translation (filed in Finnish).</i>

(54) Title: REEL-UP**(57) Abstract**

A reel-up/winder, comprising one or several members (11, 12) that support the reel/roll (10) to be formed onto a reel/roll spool (16), of which members at least one support member is a belt support member (12), which consists of a belt loop (15) which is supported by means of at least two rolls (13, 14), whose axes are substantially parallel to the axis of the reel/roll spool (16). Into the outer face of the mantle of at least one roll (13, 14) in said belt support member (12), a substantially spiral-shaped groove (204) has been formed, which extends across the axial width (1) of the roll mantle (202).



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Reel-up

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The invention concerns a reel-up/winder as defined in the preamble of claim 1.

In reeling or winding of paper or of a corresponding web-like material, commonly a drum winder or a what is called Pope-type reel-up is used. In a drum winder, there are two winding drums, on which the paper roll is formed. The paper roll that is being formed is loaded by means of a rider roll, which is fitted in contact with the top face of the paper roll. From a drum winder, further a winder with a set of belt rolls has been developed, in which one of the winding drums has been substituted for by an arrangement of a support belt. In a Pope-type reel-up, the reel is formed by means of a reel cylinder so that the web is passed through the nip formed between the reel cylinder and the reel spool onto the reel spool.

4,746,076

In the applicant's *FI Patent No. 74,260 (equivalent US Patent 4,801,758)*, an example is described of a winder with a set of belt rolls placed after a slit. The device comprises support members for supporting the roll that is being formed at least primarily by means of circumferential support and loading members for keeping the roll against the support members. The support members comprise a winding drum and a mobile support-web member, which supports the roll that is being formed over a considerable length of the circumference. Loading members press the roll against the winding drum and/or against the rigidly or displaceably supported support member of said support-belt member. The support-belt arrangement comprises a frame, to which two support rolls, an alignment roll and a tensioning roll have been attached. On the rolls, an endless support belt is supported, which can also be composed of a number of belts fitted side by side. The roll that is being formed is supported by means of the winding drum as well as by means of the portion of the support belt placed between the support rolls. One of the support rolls and the tensioning roll have been attached to the frame by means of an articulated

arm, in which connection the position of the support belt in relation to the roll that is being formed can be regulated.

In the applicant's *FI Patent No. 94,231 (equivalent US Patent 5,531,396)*, an
 5 example is described of a Pope-type reel-up for a machine-width web, which device makes use of a support belt. The reel-up comprises a reel cylinder and a first reel spool, which is in nip contact with the reel cylinder when the web is reeled through the nip onto the first reel spool, and the reel-up comprises a transfer device for the transfer of an empty second reel spool into nip contact with the reel cylinder when
 10 the first reel is complete. The reel-up also comprises a belt for supporting the web and for passing the web over the reel cylinder as well as a displaceable belt alignment roll, which has been arranged inside the belt loop and which can be transferred into nip contact with the reel placed on the first reel spool. The reel-up further comprises devices for the transfer of said belt alignment roll and of said first reel,
 15 while in nip contact, into a change position so that the web is supported by means of said belt and that the web runs through a nip formed between the belt alignment roll and said first reel.

In the *FI Patent 90,853 (Jagenberg Aktiengesellschaft)*, a loading roll for use in a
 20 reeling/winding device has been described, at which the outer face of the roll mantle is provided with a number of grooves extending across its entire width. Said grooves pass favourably as spiral-shaped at an angle of about 15° in relation to the longitudinal axis of the loading roll. Any air that has penetrated between the topmost web layer and the winding drum is carried in the grooves through the gap between the
 25 loading roll and the reel cylinder. In such a case, the air is distributed evenly, and no detrimental effects, such as folds, occur.

In reeling and winding, air is carried along with the web, which air can form an air cushion in the gap between the reel cylinder and the web in the reeling/winding nip.
 30 In the outer face of the mantle of the reel cylinder, it is possible to use relatively narrow, steep and deep grooves parallel to the circumference of the mantle, by means of which grooves the air that is carried into the gap between the web and the

reel cylinder can be passed through the nip. In this way, a situation is avoided in which the reel cylinder loses its contact with the web. Out of the gap between the web and the reel/roll that is being formed, air is also always carried along with the web through the reeling/winding nip. This air is carried between the outermost web layer and the reel/roll into the following reeling/winding nip, in which it can easily form an air bag ahead of said reeling/winding nip. In prior-art reeling/winding devices in which a set of belt rolls is used in order to support and/or to carry the reel/roll that is being formed, this air bag is eliminated by means of grooves that have been formed into the outer face of the belt of the set of belt rolls, by means of which grooves the air placed under the outermost web layer is allowed to be discharged through the nip and also to be guided in the axial direction of the roll out of the ends of the reel/roll. Since the belt is worn in operation and since the groove must operate in the same way during the entire service life of the belt, a relatively deep groove must be made into the belt face. This is why the service life of the belt becomes shorter and the noise level higher.

By means of the solution in accordance with the present invention, the air bag can be eliminated ahead of the nip of the set of belt rolls from between the outermost web layer and the reel/roll without necessity to make grooves into the outer face of the belt.

The principal characteristics of the device in accordance with the invention have been presented in the characterizing part of claim 1.

The invention is suitable for use in all such reeling or winding devices in which the roll/reel to be formed on a reel/roll spool is supported by means of at least one support device based on belt support. Of the rolls placed inside the belt loop, one or several can be provided with a groove arrangement in accordance with the invention. At least those rolls placed inside the belt loop which form a nip with the reel/roll to be formed onto a reel/roll spool should preferably be provided with a groove arrangement in accordance with the present invention.

When the grooves are made onto a belt roll that forms a nip in stead of being made onto the belt, the manufacture of the belt is simplified. The belt manufacturer does not need a great number of different tools for the manufacture of belts provided with different grooves. The same belt can be used on belt rolls provided with different groove patterns. A simpler belt also has the consequence that a greater number of manufacturers are willing to manufacture belts, in which case the buyer obtains the advantage of increased competition.

The invention will be described in the following with reference to the figures in the accompanying drawings, the invention being, however, not supposed to be confined to the details of said illustrations alone.

Figure 1 is a schematic illustration of an exemplifying embodiment of a drum winder provided with a set of belt rolls, to which winder the solution in accordance with the present invention can be applied.

Figure 2 illustrates an exemplifying embodiment of a Pope-type reel-up for a machine-width web which makes use of a support belt, to which device the solution in accordance with the present invention can also be applied.

Figure 3 shows a prior-art roll construction for use in a reeling/winding device that makes use of a belt support.

Figure 4 shows a roll construction in accordance with the present invention for use in a reeling/winding device that makes use of a belt support.

Fig. 1 shows a drum winder, in which a first winding drum 11 is shown, onto whose lower face the paper web W is introduced in the direction of the arrow S, and in which a second winding drum system 12 and a paper roll 10 to be formed on said drums are shown. The paper roll 10 is loaded with a rider roll 17. The second winding drum system 12 consists of a set of belt rolls, in which there are a first 13 and a second 14 belt roll, and of an endless belt 15 that surrounds said rolls. The

- belt 15 is favourably composed of at least two separate belts, which have been fitted side by side in the direction of the axes of the belt rolls 13, 14. By means of such a support by means of a set of belt rolls, a softer support of the paper roll 10 is obtained, in which case larger paper rolls can be formed without winding defects which arise from high nip loads. The paper web W runs through the first nip NP_1 between the first winding drum 11 and the paper roll 10 that is being formed and through the second nip NP_2 between the second winding drum system 12 and the paper roll 10 that is being formed and is wound onto the roll spool 16.
- 10 Along with the web W, air is carried through the first nip NP_1 into the gap between the web and the roll that is being formed. This air is carried further to ahead of the second nip NP_2 , where the air present between the roll 10 and its outermost web layer forms an air bag in front of the second nip NP_2 . This air bag causes defects in the roll 10, and therefore it is necessary to prevent formation of an air bag. In prior-
- 15 art solutions, formation of an air bag is prevented so that grooves have been made into the outer face of the belt 15, by means of which grooves any air that has been packed under the outermost web layer in the roll 10 is allowed to pass through the second nip NP_2 .
- 20 In the situation shown in Fig. 1, the belt 15 runs exclusively around two belt rolls 13,14, but the invention can, of course, also be applied in a situation in which the belt 15 has been passed to run on support of several rolls, as is the case, for example, in the applicant's said FI Patent 74,260.
- 25 Fig. 2 shows a Pope-type reel-up in accordance with the applicant's said FI Patent No. 94,231. This reel-up will be described herein exclusively in respect of the parts that are related to the present invention. The main part of the reel-up consists of a reel cylinder 30, along with whose circumference the web W runs before it is transferred onto the circumference of the reel 10 that is being formed around the reel
- 30 spool 16. The reel spool 16 rests and revolves in a reeling position, for example, on support of two support rails 35. The reel-up further comprises a belt 34, which runs as guided by guide rolls 31,32,33 and through the nip N between the reel cylinder

30 and the reel 10. The belt 34 supports the web W when the web arrives in the reel-up and until the web W is wound around the reel 10 that is formed on the reel spool 16. The belt 34 extends in the cross direction of the machine substantially across the entire width of the machine. The running direction of the web W and of the belt 34 is denoted with the arrow S, and empty reel spools placed in a stand-by position are denoted with the reference numerals 16', 16'', 16'''.

The belt 34 can be tensioned by means of a guide roll 33 moving substantially in a horizontal plane, and the guide roll 31 can also be shifted to the right in a substantially horizontal plane. In a situation of change of reel spool 16, a new reel spool 16' is first transferred into nip contact with the reel cylinder 30. After this, the guide roll 31 is transferred into nip contact with the reel 10, after which the reel 10 and the guide roll 31 are transferred, while the nip contact between them is maintained, along the support rails 35, to the right in the figure, into the change position. After this the new reel spool 16' is transferred, while the nip contact with the reel cylinder 30 is maintained, onto the rails 35 to the reeling position, after which the web W is cut off and transferred so that it is reeled around the new reel spool 16'.

Also in this Pope-type reel-up, in which the reel 10 is supported by means of a belt 34 between the reel cylinder 30 and a guide roll 31, the problem mentioned above occurs. Along with the web W, air is carried through the nip N between the reel cylinder 30 and the reel 10 in between the outermost web layer and the reel. This air is carried between the outermost web layer and the reel 10 again to ahead of the nip N between the reel cylinder 30 and the reel 10, where the air forms an air bag.

Fig. 3 illustrates a prior-art roll 100 for use in a reeling or winding device that makes use of belt support, which roll 100 is composed of an axle 101 and of a roll mantle 102. On the roll mantle 102, there are relatively deep guide grooves 103 parallel to the circumference of the roll mantle 102. In the figure, on the left half of the roll mantle 102, four belts 110 are illustrated, on whose outer faces there are prior-art grooves 111. On the inner faces of the belts 110, there are projections fitting into the guide grooves 103 on the roll mantle, in which way movement of the

belts 110 on the face of the belt roll 100 parallel to the axle 101 of the belt roll 100 is prevented.

Fig. 4 is a corresponding illustration of a roll 200 in accordance with the present invention for use in a reeling or winding device that makes use of belt support, which roll 200 consists of an axle 201 and of a roll mantle 202. Also in this solution, in the roll mantle 202, there are relatively deep guide grooves 203 parallel to the circumference of the roll mantle 202, into which grooves the projections provided on the inner face of the belt 210 are fitted. Also in this figure, on the left half of the roll mantle 202, four belts 210 are illustrated.

In the roll mantle 202 of the roll 200 in accordance with the invention shown in Fig. 4, there is also a second groove 204, which runs around the roll mantle 202 substantially in spiral form and which extends across the axial 201 width 1 of the roll 200. The depth h of this groove 204 is about 0.3...1.5 mm, preferably about 0.3...1.0 mm, and its width d is about 20...150 mm, preferably about 35...100 mm. The groove 204 must be relatively wide in order that the inner face of the belt 210 should be pressed into said groove 204 during running. The tension of the belt 210 is, during operation, about 20...25 kN/m (kilonewton per metre), and, as the inner face of the belt 210 is pressed into said groove 204 during running, a similar groove is "copied" in the outer face of the belt 15. This groove that has been "copied" in the outer face of the belt 204 operates as an air channel in the nip between the roll 200 and the reel/roll 10 that is being formed, along which channel the air that has arrived in front of the nip and that has been gathered between the reel 10 and its outermost web layer can be discharged through the nip, and also in the axial 201 direction of the roll 200 out of the ends of the reel/roll 10. For this second groove 204 the name vent groove is used. The cross-sectional form of the groove 204 can be, for example, a gentle arc, but since the width-to-depth ratio of the groove 204 is relatively large, all groove forms in which there are no sharp edges which abrade the belt 210 operate here well.

With this arrangement, no separate groove 111 is needed which is machined into the outer face of the belt 110 in a set of belt rolls. Thus, in a solution in accordance with the present invention, it is possible to use a standard belt 210 with a smooth outer face. The service life of a smooth standard belt 210, as compared with a
5 grooved belt 110, is longer. The spiral-shaped vent groove 204 on the roll 200 mantle 202 has not been synchronized in relation to the length of the belt 210, in which way uniform wear of the belt 210 is guaranteed.

In the following, the patent claims will be given, and the details of the invention can
10 show variation within the scope of the inventive idea defined in said claims and differ from what has been stated above by way of example only.

Claims

1. A reel-up/winder, comprising one or several members (11,12;30...34) that support the reel/roll (10) to be formed onto a reel/roll spool (16), of which members
5 at least one support member is a set of belt rolls (12;30...34), which consists of a belt loop (15, 34) which is supported by means of at least two rolls (13,14;30,31), whose axes are substantially parallel to the axis of the reel/roll spool (16), **characterized** in that into the outer face of the mantle of at least one roll (13,14;30,31) in said set of belt rolls (12;30...34), a groove pattern (204) has been formed, which
10 extends across the axial width (l) of the roll mantle (202).
2. A reel-up/winder as claimed in claim 1, **characterized** in that said groove pattern (204) is a substantially spiral-shaped groove, which extends across the axial width (l) of the roll mantle (202).
- 15
3. A winder, comprising a first winding drum (11) and a second winding drum arrangement (12), which consists of a first belt roll (13), of a second belt roll (14), and of adjacent endless belts (15) fitted around said belt rolls, the web (W) running through a first nip (NP_1) formed between the first winding drum (11) and the paper
20 roll (10) and through a second nip (NP_2) formed between the second winding drum arrangement (12) and the paper roll (10) and being wound onto a roll spool (16), **characterized** in that, into the outer face of the roll mantle (202) of the first belt roll (13) in the second winding drum arrangement (12), a substantially spiral-shaped groove (204) has been formed, which extends across the axial width (l) of the roll
25 mantle (202).
4. A reel-up, whose main part consists of a reel cylinder (30), along with whose circumference the web (W) runs before it is transferred, through a nip (N) formed by the reel cylinder (30) and by a reel spool (16) resting on support rails (35), onto
30 the circumference of the reel (10) that is formed around the reel spool (16), and which reel-up further comprises an endless belt (34), which runs as guided by guide rolls (31...33) and through the nip (N) between the reel cylinder (30) and the reel

(10), and which belt (34) supports the web (W) when the web arrives in the reel-up and until the web (W) is reeled around the reel (10) that is formed onto the reel spool (16), **characterized** in that, into the outer face (202) of the mantle of the reel cylinder (30), a substantially spiral-shaped groove (204) has been formed, which
5 extends across the axial width (l) of the mantle (202) of the reel cylinder (20).

5. A reel-up/winder as claimed in any of the claims 1 to 4, **characterized** in that the depth (h) of said groove (204) is, at its deepest point, about 0.3...1.5 mm, preferably about 0.3...1.0 mm.

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6. A reel-up/winder as claimed in any of the claims 1 to 5, **characterized** in that the width (d) of said groove (204) is about 20...150 mm, preferably about 35...100 mm.

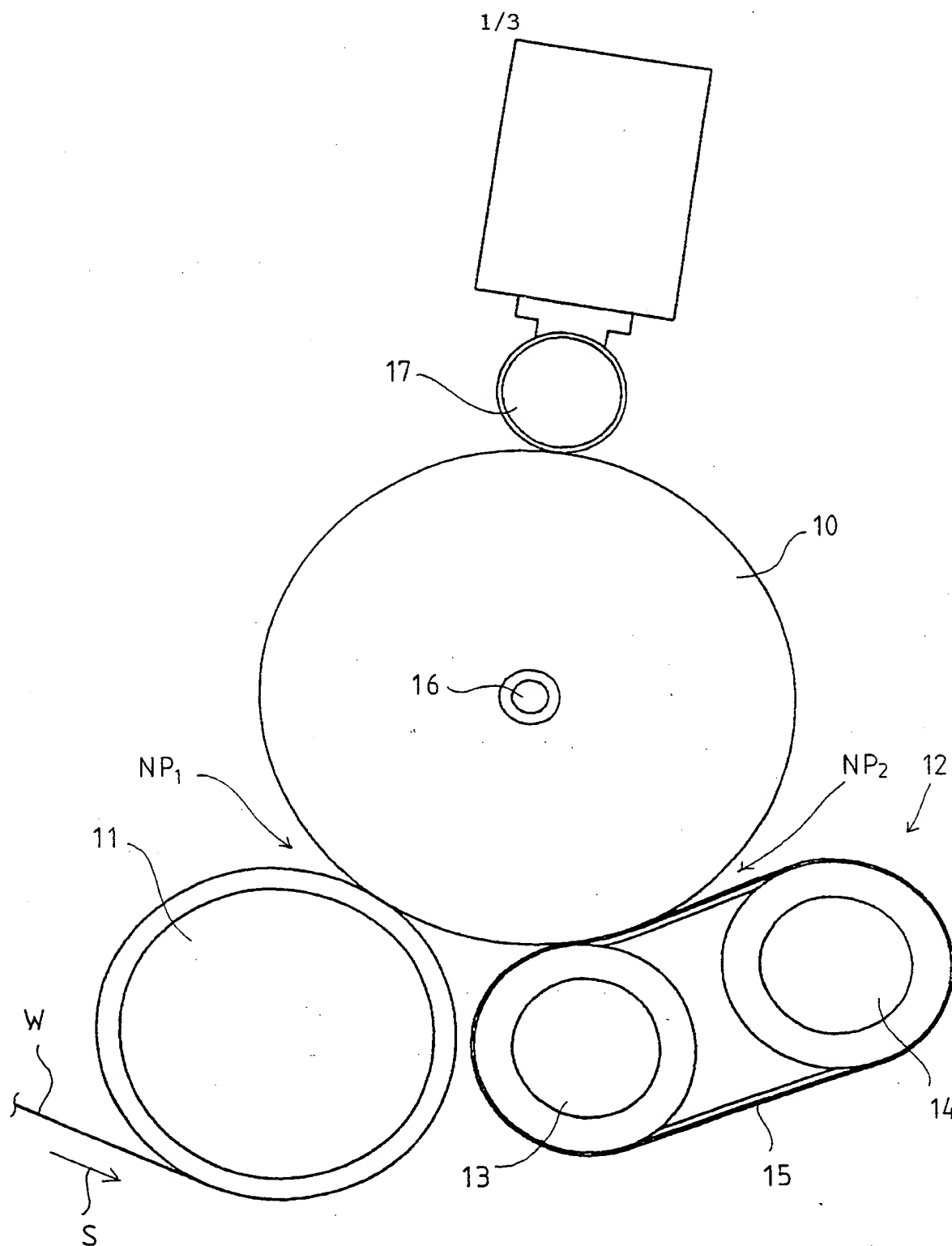
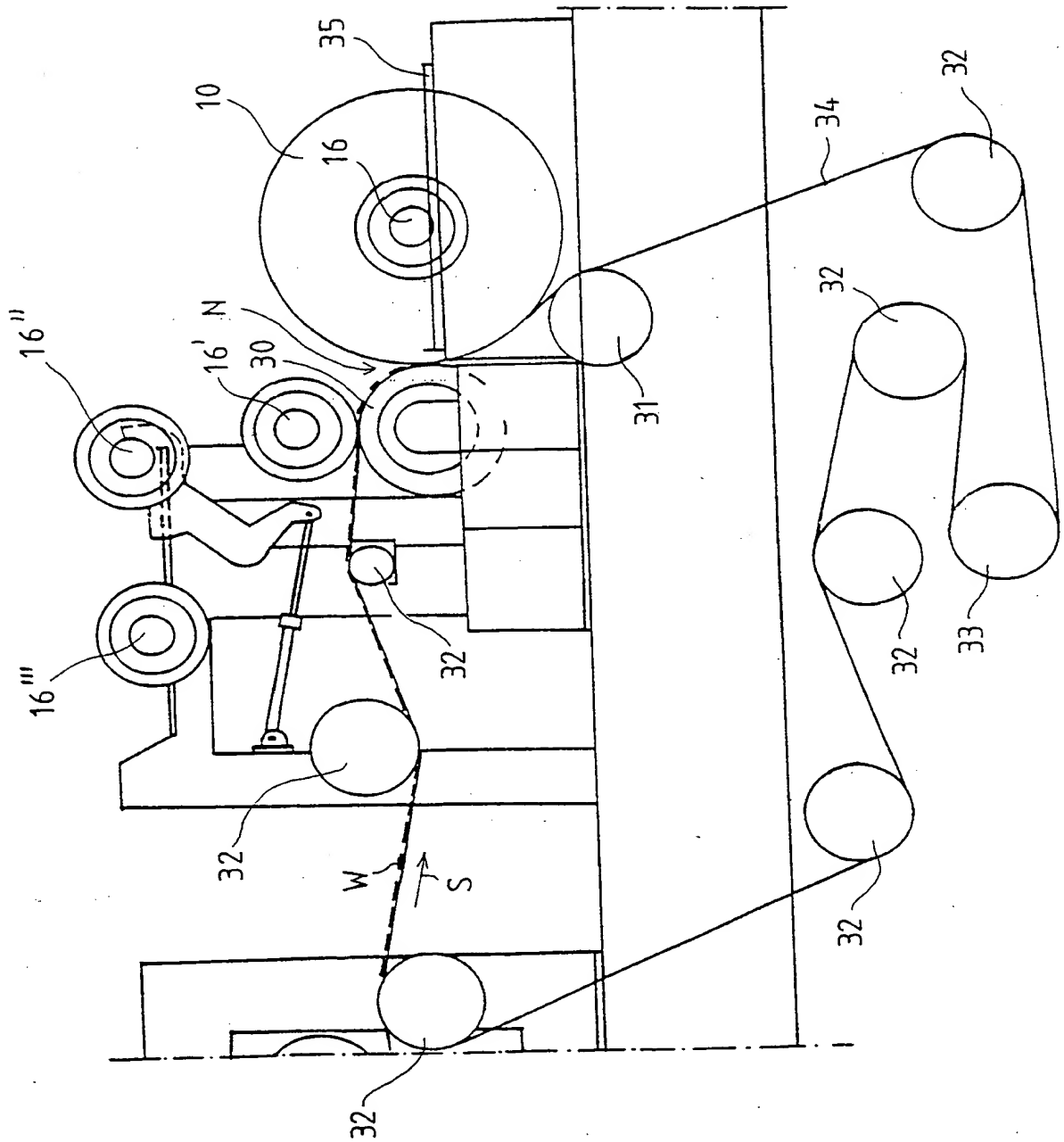


FIG. 1

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/FI 99/00321

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65H18/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B65H B54H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 658 504 A (VALMET PAPER MACHINERY INC) 21 June 1995 (1995-06-21) cited in the application abstract; figures	1,3,4
A	DE 38 16 777 A (VALMET PAPER MACHINERY INC) 8 December 1988 (1988-12-08) abstract; figures	1,3,4
A	DE 195 05 870 A (VOITH SULZER PAPIERMASCH GMBH) 22 August 1996 (1996-08-22) column 3, line 43 - column 7, line 9	1,3,4
A	DE 498 962 C (MASCHINENFABRIK WINKLER) 8 May 1930 (1930-05-08) the whole document	1,3,4

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

17 August 1999

Date of mailing of the international search report

27/08/1999

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/FI 99/00321

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0658504	A	21-06-1995	FI 94231 B AT 164143 T CA 2136601 A,C DE 69409078 D DE 69409078 T JP 7206236 A US 5531396 A	28-04-1995 15-04-1998 17-06-1995 23-04-1998 06-08-1998 08-08-1995 02-07-1996
DE 3816777	A	08-12-1988	FI 872224 A AT 400328 B AT 122888 A US 4883233 A	21-11-1988 27-12-1995 15-04-1995 28-11-1989
DE 19505870	A	22-08-1996	BR 9600594 A CA 2169990 A EP 0728691 A FI 960770 A JP 8324857 A US 5785273 A	30-12-1997 22-08-1996 28-08-1996 22-08-1996 10-12-1996 28-07-1998
DE 498962	C		NONE	

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference HS/FI980908	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI99/00321	International filing date (day/month/year) 21/04/1999	Priority date (day/month/year) 24/04/1998
International Patent Classification (IPC) or national classification and IPC B65H18/22		
Applicant VALMET CORPORATION et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 27/10/1999	Date of completion of this report <div style="text-align: right; font-size: 1.2em;">19. 07. 00</div>
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized officer Fachin. F Telephone No. +49 89 2399 2057



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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/FI99/00321

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-8 as originally filed

Claims, No.:

1-5 as received on 17/03/2000 with letter of 14/03/2000

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/FI99/00321

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-5
	No: Claims
Inventive step (IS)	Yes: Claims 1-5
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-5
	No: Claims

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

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SECTION V : CITATIONS AND EXPLANATIONS

1. The invention relates to a reel-up/winder wherein the air bag carried between the outermost web layer and the reel/roll into the following reeling/winding nip is eliminated ahead of the nip of the set of belt rolls without the necessity to make grooves into the outer surface of the belt.
The posed problem is solved by providing in the reel-up/winder **at least one roll** (being in nip contact with the reel/roll to be formed in the set of belt rolls) **with a substantially spiral-shaped groove pattern, which extends across the axial width of the roll mantle.**
2. Since every one of the documents cited in the search report fails in disclosing **at least** the above-mentioned features, the subject-matter of claim 1 as well as that of its dependent claims are considered to fulfil the criterion set forth in Article 33(2) PCT (novelty).
3. Furthermore the invention, as disclosed in independent claim 1 and in its dependent claims, is considered not to be obvious to a person skilled in the art.
Document EP-A-0 658 504 (D1), which is considered to represent the closest prior art, describes a method and a device for reeling paper using a support belt and fails in disclosing a spiral-shaped groove on at least one roll.
The documents cited both in the search report and in the description, defining simply the general state of the art, are not considered to be of particular relevance.

Since none of the above cited documents, either taken alone or in combination, contain hints for a solution like that disclosed in the present claim 1, the subject-matter of claim 1 and that of its dependent claims are considered to fulfil the criterion set forth in Article 33(3) PCT (inventive step).
4. Finally, since it appears that the claimed invention can be made or used in a technological sense in industry, it is considered to show industrial applicability within the meaning of Article 33(4) PCT.

SECTION VII

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI99/00321

5. The publication number of the "equivalent US Patent" cited at page 1 is wrong.
The "FI Patents" cited in the description should have been identified through their publication numbers.

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Claims

1. A reel-up/winder, comprising one or several members (11,12;30...34) that support the reel/roll (10) to be formed onto a reel/roll spool (16), of which members
5 at least one support member is a set of belt rolls (12;30...34), which consists of a belt loop (15, 34) which is supported by means of at least two rolls (13,14;30,31), whose axes are substantially parallel to the axis of the reel/roll spool (16), **characterized** in that into the outer face of the mantle of at least one roll (13,14;30,31) being in nip contact with the reel/roll (10) to be formed in said set of belt rolls
10 (12;30...34), a substantially spiral-shaped groove pattern (204) has been formed, which extends across the axial width (l) of the roll mantle (202).
2. A reel-up/winder as claimed in claim 1, **characterized** in that it comprises a first winding drum (11) and a second winding drum arrangement (12), which consists of
15 a first belt roll (13), of a second belt roll (14), and of adjacent endless belts (15) fitted around said belt rolls, the web (W) running through a first nip (NP₁) formed between the first winding drum (11) and the paper roll (10) and through a second nip (NP₂) formed between the second winding drum arrangement (12) and the paper roll (10) and being wound onto a roll spool (16), whereas into the outer face of the roll
20 mantle (202) of the first belt roll (13) being in nip contact with the paper roll (10) to be formed in the second winding drum arrangement (12), a substantially spiral-shaped groove (204) has been formed, which extends across the axial width (l) of the roll mantle (202).
- 25 3. A reel-up/winder as claimed in claim 1, **characterized** in that it comprises a reel cylinder (30), along with whose circumference the web (W) runs before it is transferred, through a nip (N) formed by the reel cylinder (30) and by a reel spool (16) resting on support rails (35), onto the circumference of the reel (10) that is formed around the reel spool (16), and which reel-up further comprises an endless
30 belt (34), which runs as guided by guide rolls (31...33) and through the nip (N) between the reel cylinder (30) and the reel (10), and which belt (34) supports the web (W) when the web arrives in the reel-up and until the web (W) is reeled around

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the reel (10) that is formed onto the reel spool (16), whereas into the outer face (202) of the mantle of the reel cylinder (30) being in nip contact with the paper roll (10), a substantially spiral-shaped groove (204) has been formed, which extends across the axial width (l) of the mantle (202) of the reel cylinder (20).

5

4. A reel-up/winder as claimed in any of the claims 1 to 3, characterized in that the depth (h) of said groove (204) is, at its deepest point, about 0.3...1.5 mm, preferably about 0.3...1.0 mm.

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5. A reel-up/winder as claimed in any of the claims 1 to 4, characterized in that the width (d) of said groove (204) is about 20...150 mm, preferably about 35...100 mm.

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RECORD COPY PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/FI 99 / 0 0 3 2 1

International Application No.

International Filing Date **21 APR 1999 (21. 04. 99)**

**The Finnish Patent Office
PCT International Application**

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) HS/FI980908

Box No. I	TITLE OF INVENTION	
Reel-up		
Box No. II	APPLICANT	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) VALMET CORPORATION Panuntie 6 FIN-00620 HELSINKI Finland		<input type="checkbox"/> This person is also inventor. Telephone No. Facsimile No. Teleprinter No.
State (that is, country) of nationality: Finland		State (that is, country) of residence: Finland
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input checked="" type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box		
Box No. III	FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) NISKANEN Heikki Satakunnanpolku 37 FIN-04400 JÄRVENPÄÄ Finland		This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)
State (that is, country) of nationality: Finland		State (that is, country) of residence: Finland
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box		
<input type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.		
Box No. IV	AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) Forssén & Salomaa Oy Yrjönkatu 30 FIN-00100 Helsinki Finland		Telephone No. +358 9 615 3500 Facsimile No. +358 615 35111 Teleprinter No.
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.		

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Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ AP **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria and Utility Model | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria | |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NO Norway |
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| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic and Utility Model | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany and Utility Model | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DK Denmark and Utility Model | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> EE Estonia and Utility Model | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> FI Finland and Utility Model | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> SK Slovakia and Utility Model |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IS Iceland | |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> ZW Zimbabwe |
| | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |
| <input checked="" type="checkbox"/> LC Saint Lucia | |
| <input checked="" type="checkbox"/> LK Sri Lanka | |
| <input checked="" type="checkbox"/> LR Liberia | |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☒ AE United Arab Emirates
- ☒ ZA South Africa
- ☐

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

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Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1) 24 Apr 1998(24-04-98)	980908	Finland (FI)		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): **980908**

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):	Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):
ISA / EPO	Date (day/month/year) Number Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets: request : 3 description (excluding sequence listing part) : 7 claims : 2 abstract : 1 drawings : 3 sequence listing part of description : Total number of sheets : 16	This international application is accompanied by the item(s) marked below: 1. <input checked="" type="checkbox"/> fee calculation sheet 2. <input type="checkbox"/> separate signed power of attorney 3. <input checked="" type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input type="checkbox"/> translation of international application into (language): 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input type="checkbox"/> other (specify):
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure of the drawings which should accompany the abstract: 1 and 4

Language of filing of the international application: Finnish

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

FORSSÉN & SALOMAA OY

Hans Stellberg
Hans Stellberg

For receiving Office use only		2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:	21 APR 1999 (21-04-1999)	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA / EP	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

Date of receipt of the record copy by the International Bureau:

18 MAY 1999

(18.05.99)

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Rullauslaite

5

Keksinnön kohteena on patenttivaatimuksen 1 johdanto-osassa määritelty rullauslaite.

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Paperin tai muun vastaavan rainamuotoisen materiaalin rullauksessa käytetään yleisesti kantotelarullainta tai niin sanottua pope-rullainta. Kantotelarullaimessa on kaksi kantotelaa, joiden päällä paperirulla muodostetaan. Muodostuvaa paperirullaa kuormitetaan paperirullan yläpintaan kosketukseen tulevalla painotelalla. Kantotelarullaimesta on vielä kehitetty hihnatelastorullain, jossa toinen kantotela on korvattu tukirainajärjestelyllä. Pope-rullaimessa rulla muodostetaan rullaussylinterillä siten, että raina johdetaan rullaussylinterin ja rullausytimen välisen nipin kautta rullausytimelle.

15

Hakijan *FI-patentissa 74260 (vastaava US-patentti 4,801,758)* on esitetty eräs esimerkki pituusleikkurin jälkeisestä hihnatelastorullaimesta. Laite käsittää kannatinelimet muodostettavan rullan kannattamiseksi ainakin pääasiallisesti kehäkannatuksella ja kuormituselimet rullan pitämiseksi vasten kannatuselimiä. Kannatuselimet käsittävät kantotelan ja liikkuvan tukirainaelimen, joka tukee muodostettavaa rullaa huomattavalla kehän pituudella. Kuormituselimet painavat rullaa vasten kantotelaa ja/tai sanotun tukirainaelimen jäykästi tai liikkuvasti tuettua tukielintä. Tukirainajärjestely käsittää rungon johon on kiinnitetty kaksi tukitelaa, ohjaustela ja kiristystela. Teloihin on tuettu päätön tukiraina, joka voi olla myös muodostettu useista rinnakkaisista hihnoista. Muodostettavaa rullaa tuetaan kantotelalla sekä tukitelojen välisellä tukirainan osuudella. Toinen tukitela sekä kiristystela on kiinnitetty nivelvarren avulla runkoon, jolloin tukirainan asemaa muodostettavaan rullaan nähden voidaan säätää.

30

Hakijan *FI-patentissa 94231 (vastaava US-patentti 5,531,396)* on esitetty eräs esimerkki tukihihnaa käyttävästä konelevyisen rainan pope-tyyppisestä rullauslaitteesta. Rullauslaite käsittää rullaussylinterin ja ensimmäisen rullausytimen, joka on

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nippikosketuksessa rullaussylinteriin kun rainaa rullataan nipin kautta ensimmäiselle rullausytimelle, ja siirtolaitteen tyhjän toisen rullausytimen siirtämiseksi nippikosketukseen rullaussylinterin kanssa kun ensimmäinen rulla on valmis. Rullauslaite käsittää myös hihnan rainan tukemiseksi ja rainan viemiseksi rullaussylinterin yli ja siirrettävän hihnanohjaustelan, joka on järjestetty hihnasilmukan sisälle ja joka on siirrettävissä nippikosketukseen ensimmäisellä rullausytimellä olevaan rullaan. Rullauslaite käsittää lisäksi laitteet mainitun hihnanohjaustelan ja mainitun ensimmäisen rullan siirtämiseksi nippikosketuksessa vaihtoasemaan siten, että rainaa tuetaan mainitulla hihnalla ja että raina kulkee hihnanohjaustelan ja mainitun ensimmäisen rullan välisen nipin kautta.

FI-patentissa 90853 (Jagenberg Aktiengesellschaft) on esitetty rullauslaitteessa käytettävä kuormitustela, jonka vaipan ulkopinta on varustettu useilla sen koko leveyden yli ulottuvilla urilla. Mainitut urat kulkevat edullisesti ruuvimaisesti noin 15° kulmassa kuormitustelan pituusakseliin nähden. Ylimmän rainakerroksen ja kelausrullan väliin päässyt ilma kuljetetaan urissa kuormitustelan ja kelausrullan välisen raon läpi. Ilma jakautuu tällöin tasaisesti, eikä haittavaikutuksia kuten poimuja esiinny.

Rullauksessa rainan mukana kulkee ilmaa, joka voi muodostaa ilmatyynyn rullaussylinterin ja rainan väliseen kitaan rullausnipissä. Rullaussylinterin vaipan ulkopinnassa voidaan käyttää vaipan kehän suuntaisia suhteellisen kapeita, jyrkkiä ja syviä uria, joiden välityksellä rainan ja rullaussylinterin väliseen kitaan kulkeutuva ilma voidaan johtaa nipin läpi. Tällä tavoin estetään se tilanne, että rullaussylinteri menettäisi kosketuksensa rainaan. Rainan ja muodostuvan rullan välisestä kidasta kulkeutuu myös aina ilmaa rullausnipin läpi rainan mukana. Tämä ilma kulkeutuu uloimman rainakerroksen ja rullan välissä seuraavaan rullausnippiin, jossa se voi helposti muodostaa ilmapussin mainitun rullausnipin eteen. Tekniikan tason rullauslaitteissa, joissa käytetään hihnatelastoa muodostuvan rullan tukemiseen ja/tai kannattamiseen tämä ilmapussi eliminoidaan hihnatelaston hihnan ulkopintaan muodostetulla urituksella, jolla päästetään uloimman rainakerroksen alla oleva ilma purkautumaan nipin läpi sekä ohjautumaan myös telan akselin suuntaisesti rullan päistä ulos. Koska hihna

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kuluu käytössä ja uran pitää toimia samalla tavalla koko hihnan käyttöiän ajan, hihnan pintaan täytyy tehdä suhteellisen syvä ura. Tästä johtuen hihnan käyttöikä lyhenee ja melutaso kasvaa.

- 5 Keksinnön mukaisella ratkaisulla saadaan ilmapussi poistettua hihnatelaston nipin edestä uloimman rainakerroksen ja rullan välistä ilman, että hihnan ulkopintaan tarvitsisi tehdä uria.

- 10 Keksinnön mukaisen laitteen pääasialliset tunnusmerkit on esitetty patenttivaatimuksen 1 tunnusmerkkiosassa.

- 15 Keksintö soveltuu käytettäväksi kaikissa sellaisissa rullauslaitteissa, joissa rullausytimelle muodostettavaa rullaa tuetaan ainakin yhdellä hihnatuentaan perustuvalla tukilaitteella. Hihnasilmukan sisällä olevista teloista voidaan yksi tai useampi varustaa keksinnön mukaisella urituksella. Ainakin ne hihnasilmukan sisällä olevat telat, jotka muodostavat nipin rullausytimelle muodostettavan rullan kanssa on edullista varustaa keksinnön mukaisella urituksella.

- 20 Kun urat tehdään nipin muodostavaan hihnatelaan hihnan sijasta, hihnan valmistus yksinkertaistuu. Hihnavalmistaja ei tarvitse suuria määriä erilaisia työkaluja erilaisilla urituksilla varustettujen hihnojen valmistusta varten. Samaa hihnaa voidaan käyttää erilaisilla urakuvioilla varustetuissa hihnateloissa. Yksinkertaisempi hihna johtaa myös siihen, että useampi valmistaja on halukas valmistamaan hihnoja, jolloin ostaja hyötyy suuremmasta kilpailusta.

- 25 Keksintöä selostetaan seuraavassa oheisten piirustusten kuvioihin viitaten, joiden yksityiskohtiin keksintöä ei kuitenkaan ole tarkoitus yksinomaan rajoittaa.

- 30 Kuviossa 1 on esitetty kaaviomaisesti esimerkki hihnatelastolla varustetusta kantotela-rullaimesta, johon keksinnön mukaista ratkaisua voidaan soveltaa.

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Kuviossa 2 on esitetty esimerkki tukihihnaa käyttävästä konelevyisen rainan pope-
tyyppisestä rullauslaitteesta, johon keksinnön mukaista ratkaisua voidaan myös
soveltaa.

- 5 Kuviossa 3 on esitetty hihnatuske soveltavassa rullauslaitteessa käytettävä tekniikan
tason mukainen telarakenne.

Kuviossa 4 on esitetty hihnatuske soveltavassa rullauslaitteessa käytettävä keksinnön
mukainen telarakenne.

10

- Kuviossa 1 on esitetty kantotelarullain, jossa näkyy ensimmäinen kantotela 11, jonka
alapinnalle paperiraina W tuodaan nuolen S suunnassa ja toinen kantotelajärjestelmä
12 sekä niiden päälle muodostuva paperirulla 10. Paperirullaa 10 kuormitetaan
painotelalla 17. Toinen kantotelajärjestelmä 12 muodostuu hihnatelastosta, jossa on
15 ensimmäinen 13 ja toinen 14 hihnata sekä näitä ympäröivästä päättymättömästä
hihnasta 15. Hihna 15 muodostuu edullisesti vähintään kahdesta erillisestä hihnasta,
jotka on asennettu vierekkäin hihnatelosten 13,14 akselin suunnassa. Tällaisella
hihnatelastokannatuksella saadaan aikaiseksi paperirullan 10 pehmeämpi kannatus,
jolloin voidaan muodostaa suurempia paperirullia ilman suurista nippikuormista
20 aiheutuvia rullausvikoja. Paperiraina W kulkee ensimmäisen kantotelan 11 ja
muodostuvan paperirullan 10 välisen ensimmäisen nipin NP_1 kautta sekä toisen
kantotelajärjestelmän 12 ja muodostuvan paperirullan 10 välisen toisen nipin NP_2
kautta ja rullautuu rullausytimelle 16.

- 25 Rainan W mukana kulkeutuu ensimmäisen nipin NP_1 läpi ilmaa rainan ja muodostu-
van rullan väliin. Tämä ilma kulkeutuu edelleen toisen nipin NP_2 eteen, jossa rullan
10 ja sen uloimman rainakerroksen välissä oleva ilma muodostaa toisen nipin NP_2
eteen ilmapussin. Tästä ilmapussista aiheutuu vikoja rullaan 10 ja siksi ilmapussin
syntyminen täytyy estää. Tekniikan tason ratkaisuissa ilmapussin muodostuminen
30 estetään siten, että hihnan 15 ulkopintaan on tehty uritus, jonka avulla rullan 10
uloimman rainakerroksen alle pakkautunut ilma päästetään toisen nipin NP_2 läpi.

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Kuvion 1 tilanteessa hihna 15 kulkee pelkästään kahden hihnatelan 13,14 ympäri, mutta keksintöä voidaan luonnollisesti soveltaa myös tilanteessa, jossa hihna 15 on johdettu kulkemaan useamman telan tukemana kuten esim. hakijan em. FI-patentissa 74260 on asianlaita.

5

Kuviossa 2 on esitetty hakijan em. FI-patentin 94231 mukainen pope-tyyppinen rullauslaite. Tätä rullauslaitetta selostetaan tässä pelkästään nyt esillä olevaan keksintöön liittyviltä osiltaan. Rullaimen pääosan muodostaa rullaussylinteri 30, jonka kehän mukana raina W kiertää ennen siirtymistään rullausytimen 16 ympärille muodostuvan rullan 10 kehälle. Rullausydin 16 lepää ja pyörii rullausasemassa esim. kahden kannatinkiskon 35 varassa. Rullain käsittää lisäksi hihnan 34, joka kulkee johtotelojen 31,32,33 ohjaamana sekä rullaussylinterin 30 ja rullan 10 välisestä nipistä N. Hihna 34 kannattaa rainaa W sen saapuessa rullauslaitteelle ja siihen asti, kunnes raina W kiertyy rullausytimelle 16 muodostuvan rullan 10 ympäri. Hihna 34 ulottuu koneen poikkisuunnassa olennaisesti koko sen leveyden yli. Rainan W ja hihnan 34 kulkusuuntaa on merkitty nuolella S ja tyhjiä valmiusasemassa olevia rullausytimiä on merkitty viitenumeroilla 16',16'',16'''.

Hihnaa 34 voidaan kiristää olennaisesti vaakatasossa liikkuvalla johtotelalla 33 ja johtotela 31 voidaan myös siirtää olennaisesti vaakatasossa oikealle. Rullausytimen 16 vaihtotilanteessa siirretään ensin uusi rullausydin 16' nippikosketukseen rullaussylinterin 30 kanssa. Tämän jälkeen siirretään johtotela 31 nippikosketukseen rullan 10 kanssa, jonka jälkeen rullaa 10 ja johtotela 31 siirretään niiden välinen nippikosketus säilyttäen kannatinkiskoja 35 myöten kuviossa oikealle vaihtoasentoon. Tämän jälkeen uusi rullausydin 16' siirretään nippikosketus rullaussylinteriin 30 säilyttäen kiskoille 35 rullausasentoon, jonka jälkeen raina W katkaistaan ja siirretään kiertämään uutta rullausyaintä 16'.

Myös tässä pope-tyyppisessä rullaimessa, jossa rullaa 10 tuetaan hihnalla 34 rullaussylinterin 30 ja johtotelan 31 välissä esiintyy edellä mainittu ongelma. Rainan W mukana kulkeutuu rullaussylinterin 30 ja rullan 10 välisen nipin N läpi ilmaa uloimman rainakerroksen ja rullan väliin. Tämä ilma kulkeutuu uloimman rainakerroksen

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ja rullan 10 välissä uudelleen rullaussylinterin 30 ja rullan 10 välisen nipin N eteen, jossa se muodostaa ilmapussin.

5 Kuviossa 3 on esitetty tekniikan tason mukainen hihnatuske soveltavassa rullauslaitteessa käytettävä tela 100, joka muodostuu akselistä 101 ja telavaipasta 102. Telavaipassa 102 on suhteellisen syvät telavaipan 102 kehän suuntaiset ohjainurat 103. Kuvioon on telavaipan 102 vasempaan puoliskoon piirretty neljä hihnaa 110, joiden ulkopinnassa on tekniikan tason mukaiset urat 111. Hihnojen 110 sisäpinnassa on telavaipan 102 ohjainuriin 103 asettuvat ulokkeet, jolloin hihnojen 110 liikkuminen
10 hihnatelan 100 pinnalla hihnatelan 100 akselin 101 suuntaisesti on estetty.

Kuviossa 4 on esitetty vastaavasti keksinnön mukainen hihnatuske soveltavassa rullauslaitteessa käytettävä tela 200, joka muodostuu akselistä 201 ja telavaipasta 202. Myös tässä ratkaisussa telavaipassa 202 on suhteellisen syvät telavaipan 202
15 kehän suuntaiset ohjainurat 203, johon hihnan 210 sisäpinnassa olevat ulokkeet asettuvat. Myös tähän kuvioon on telavaipan 202 vasempaan puoliskoon piirretty neljä hihnaa 210.

Kuviossa 4 esitetyssä keksinnön mukaisen telan 200 telavaipassa 202 on myös toinen,
20 olennaisesti spiraalina telavaippaa 202 kiertävä, telan 200 akselin 201 suuntaisen leveyden l yli ulottuva, ura 204. Tämän uran 204 syvyys h on noin 0,3—1,5 mm, edullisesti noin 0,3—1,0 mm ja leveys d noin 20—150 mm, edullisesti noin 35—100 mm. Uran 204 tulee olla suhteellisen leveä, jotta hihnan 210 sisäpinta painuu mainittuun uraan 204 ajon aikana. Hihnan 210 kireys on ajon aikana noin
25 20—25 kN/m ja kun hihnan 210 sisäpinta ajon aikana painuu mainittuun uraan 204 hihnan 15 ulkopintaan “kopioituu” vastaavanlainen ura. Tämä hihnan 204 ulkopintaan “kopioitunut” ura toimii telan 200 ja muodostettavan rullan 10 välisen nipin ilmakeinavana, jota myöten nipin eteen rullan 10 ja sen uloimman rainakerroksen väliin kertynyt ilma pääsee purkautumaan nipin läpi, sekä myöskin telan 200 akselin
30 201 suunnassa rullan 10 päistä ulos. Tästä toisesta urasta 204 käytetään nimitystä ventauritus. Uran 204 poikkileikkauksen muoto voi olla esim. loiva kaari, mutta

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koska uran 204 leveys-syvyyssuhde on suhteellisen suuri kaikki uramuodot, joissa ei ole hihnaa 210 kuluttavia teräviä reunoja toimivat tässä hyvin.

- 5 Tällä järjestelyllä ei tarvita erillistä hihnatelaston hihnan 110 ulkopintaan työstettyä uraa 111. Keksinnön mukaisessa ratkaisussa voidaan siten käyttää ulkopinnaltaan sileätä vakiohihnaa 210. Sileän vakiohihnan 210 kestoikä uritettuun hihnaan 110 verrattuna on pitempi. Telan 200 vaipan 202 spiraalimainen ventaura 204 ei ole tahdistettu hihnan 210 pituuteen, jolla varmistetaan hihnan 210 tasainen kuluminen.
- 10 Seuraavassa esitetään patenttivaatimukset, joiden keksinnöllisen ajatuksen puitteissa keksinnön yksityiskohdat voivat vaihdella edellä vain esimerkin omaisesti esitetystä.

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Patenttivaatimukset

1. Rullauslaite käsittää yhden tai useampia rullausytimelle (16) muodostettavaa rullaa (10) tukevia elimiä (11,12;30—34), joista ainakin yksi tukielin on hihnatelasto (12; 30—34), joka muodostuu hihnasilmukasta (15,34), joka on tuettu ainakin kahdella telalla (13,14;30,31), joiden akselit ovat olennaisesti yhdensuuntaiset rullausytimen (16) akselin kanssa, **tunnettu** siitä, että mainitun hihnatelaston (12;30—34) ainakin yhden telan (13,14;30,31) vaipan ulkopintaan on muodostettu urakuvio (204), joka ulottuu telavaipan (202) akselisuuntaisen leveyden (l) yli.
2. Patenttivaatimuksen 1 mukainen rullauslaite, **tunnettu** siitä, että mainittu urakuvio (204) on olennaisesti spiraalimainen ura, joka ulottuu telavaipan (202) akselisuuntaisen leveyden (l) yli.
3. Rullauslaite käsittää ensimmäisen kantotelan (11) ja toisen kantotelajärjestelmän (12), joka muodostuu ensimmäisestä hihnatelasta (13), toisesta hihnatelasta (14) ja näiden ympärille sovitetuista vierekkäisistä päättömistä hihnoista (15), jolloin raina (W) kulkee ensimmäisen kannatustelan (11) ja paperirullan (10) välisen ensimmäisen nipin (NP₁) kautta ja toisen kantotelajärjestelmän (12) ja paperirullan (10) välisen toisen nipin (NP₂) kautta ja rullautuu rullausytimelle (16), **tunnettu** siitä, että toisen kantotelajärjestelmän (12) ensimmäisen hihnatelan (13) telavaipan (202) ulkopintaan on muodostettu olennaisesti spiraalimainen ura (204), joka ulottuu telavaipan (202) akselisuuntaisen leveyden (l) yli.
4. Rullauslaite, jonka pääosan muodostaa rullaussylinteri (30), jonka kehän mukana raina (W) kiertää ennen siirtymistään rullaussylinterin (30) ja kannatinkiskoilla (35) lepäävän rullausytimen (16) muodostavan nipin (N) kautta rullausytimen (16) ympärille muodostuvan rullan (10) kehälle, käsittää lisäksi päättömän hihnan (34), joka kulkee johtotelojen (31—33) ohjaamana sekä rullaussylinterin (30) ja rullan (10) välisestä nipistä (N) ja joka hihna (34) kannattaa rainaa (W) sen saapuessa rullauslaitteelle ja siihen asti, kunnes raina (W) kiertyy rullausytimelle (16) muodostuvan rullan (10) ympäri, **tunnettu** siitä, että rullaussylinterin (30) vaipan ulkopintaan

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(202) on muodostettu olennaisesti spiraalimainen ura (204), joka ulottuu rullaussylin-
terin (30) vaipan (202) akselisuuntaisen leveyden (l) yli.

5 5. Jonkin patenttivaatimuksen 1—4 mukainen rullauslaite, **tunnettu** siitä, että maini-
tun uran (204) syvyys (h) on syvimmissä kohdassaan noin 0,3—1,5 mm, edullisesti
noin 0,3—1,0 mm.

6. Jonkin patenttivaatimuksen 1—5 mukainen rullauslaite, **tunnettu** siitä, että maini-
tun uran (204) leveys (d) on noin 20—150 mm, edullisesti noin 35—100 mm.

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Tiivistelmä

Rullauslaite käsittää yhden tai useampia rullausytimelle (16) muodostettavaa rullaa (10) tukevia elimiä (11,12), joista ainakin yksi tukielin on hihnatukielin (12), joka muodostuu hihnasilmukasta (15), joka on tuettu ainakin kahdella telalla (13,14), joiden akselit ovat olennaisesti yhdensuuntaisia rullausytimen (16) akselin kanssa. Mainitun hihnatukielimen (12) ainakin yhden telan (13,14) vaipan ulkopintaan on muodostettu olennaisesti spiraalimainen ura (204), joka ulottuu telavaipan (202) akselisuuntaisen leveyden (l) yli.

(FIG. 1 ja 4)

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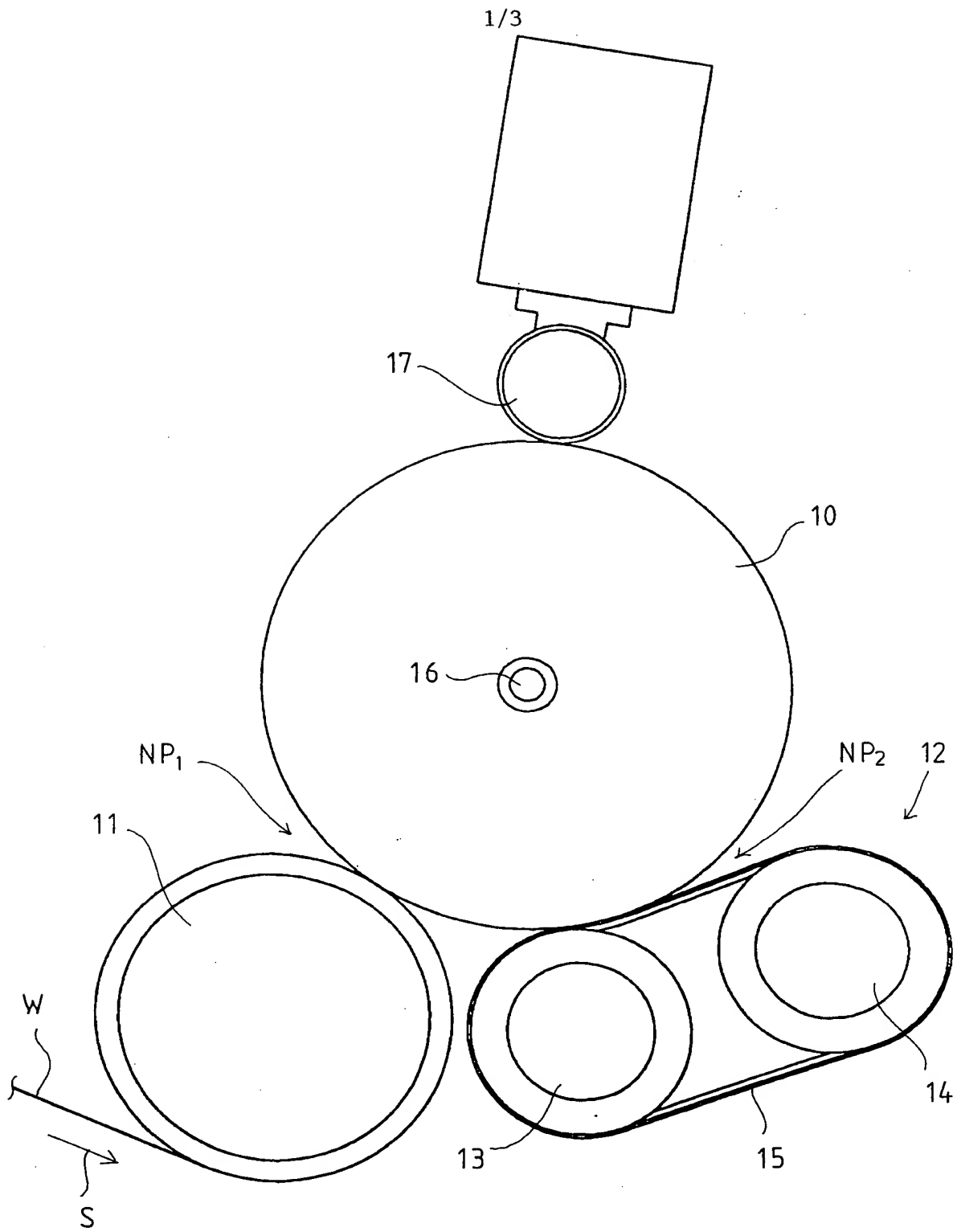


FIG.1

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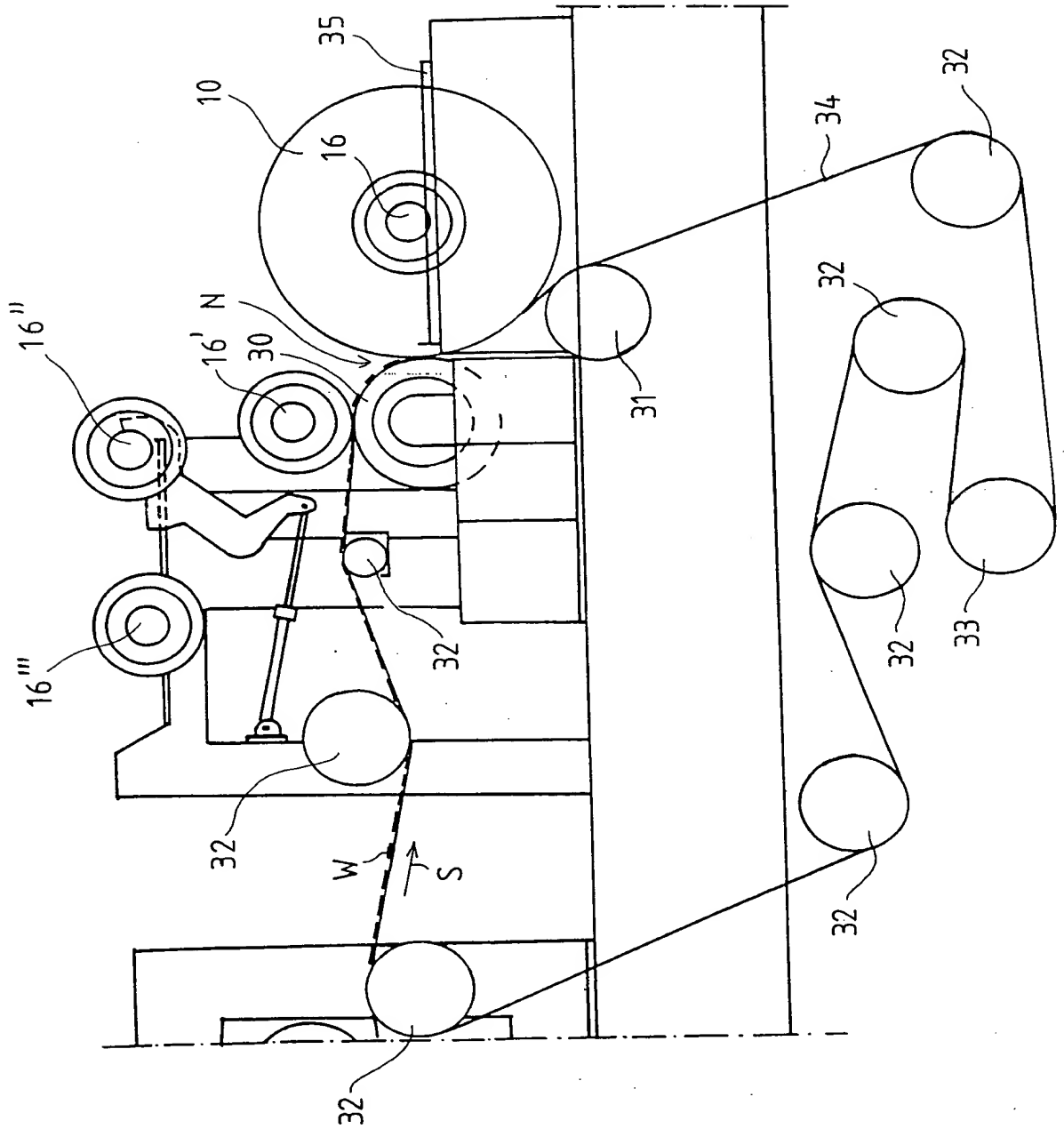


FIG. 2

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Prior Art

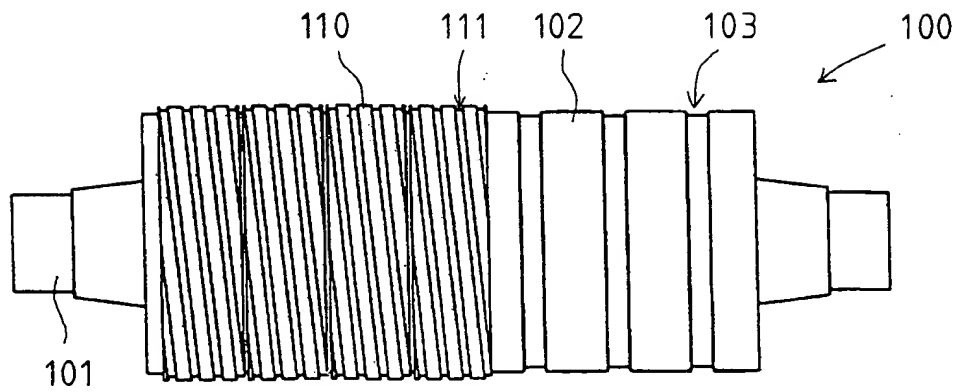


FIG. 3

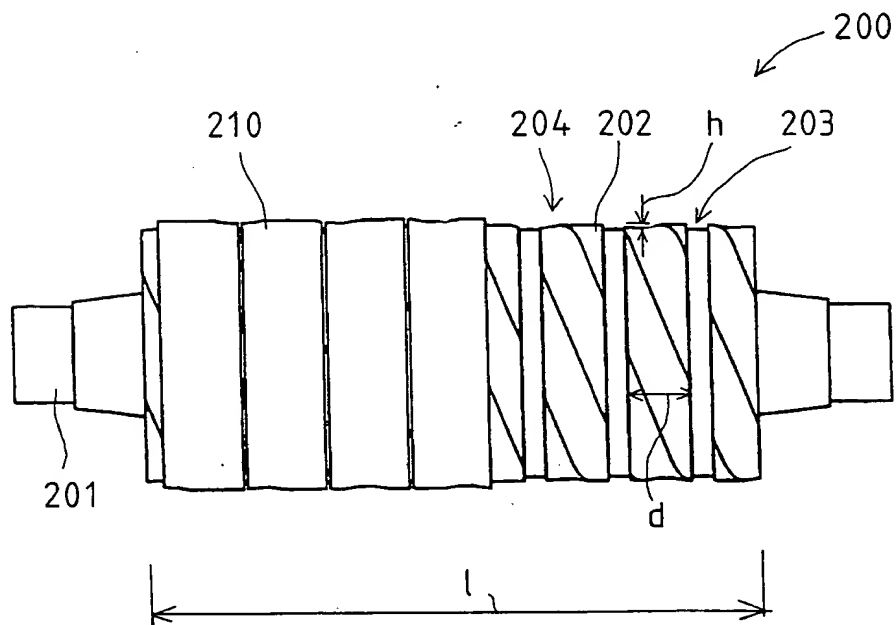


FIG. 4

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference HS/FI980908	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/FI 99/ 00321	International filing date (day/month/year) 21/04/1999	(Earliest) Priority Date (day/month/year) 24/04/1998
Applicant VALMET CORPORATION et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1, 4

☐ None of the figures.

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INTERNATIONAL SEARCH REPORT

International Application No.

PCT/FI 99/00321

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65H18/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B65H B54H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 658 504 A (VALMET PAPER MACHINERY INC) 21 June 1995 (1995-06-21) cited in the application abstract; figures ----	1,3,4
A	DE 38 16 777 A (VALMET PAPER MACHINERY INC) 8 December 1988 (1988-12-08) abstract; figures ----	1,3,4
A	DE 195 05 870 A (VOITH SULZER PAPIERMASCH GMBH) 22 August 1996 (1996-08-22) column 3, line 43 - column 7, line 9 ----	1,3,4
A	DE 498 962 C (MASCHINENFABRIK WINKLER) 8 May 1930 (1930-05-08) the whole document -----	1,3,4

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

17 August 1999

Date of mailing of the international search report

27/08/1999

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/FI 99/00321

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			US 5785273 A	28-07-1998
DE 498962	C		NONE	

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